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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 4873-2 (2008): Methods of laboratory testing of wood preservatives against fungi and borers (powder post beetles) : Part 2 Determination of threshold values of wood preservatives against borers (powder post beetles) [CED 9: Timber and Timber Stores]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



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भारतीय मानक  
फफूँदी और बेधकों (पाउडर पोस्ट बीटल) से लकड़ी की  
सुरक्षा के प्रयोगशाला परीक्षण की पद्धतियाँ  
भाग 2 बेधकों (पाउडर पोस्ट बीटल) से लकड़ी की  
सुरक्षा के थ्रेशहोल्ड मान ज्ञात करना  
( दूसरा पुनरीक्षण )

*Indian Standard*

**METHODS OF LABORATORY TESTING OF  
WOOD PRESERVATIVES AGAINST FUNGI AND  
BORERS (POWDER POST BEETLES)**

**PART 2 DETERMINATION OF THRESHOLD VALUES OF  
WOOD PRESERVATIVES AGAINST BORERS (POWDER POST BEETLES)**

*( Second Revision )*

ICS 71.100.50

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

## FOREWORD

This Indian Standard (Part 2) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Timber and Timber Stores Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1968 and covered the methods for the laboratory testing of wood preservatives against fungi. Details of preservatives, methods of preservative treatment of timber, etc, have been covered in IS 401 : 2001 'Preservation of timber — Code of practice (*fourth revision*)'. Based on the experience gained in the use of the standard, the first revision of the standard was brought out in 1993, additionally incorporating *Gloeophyllum trabeum* (*Pers. ex. Fries*) Murr. as a test fungi for preparation of test culture.

In its present revision, the standard has been brought out in two parts in view of requests for incorporation of method of laboratory testing of wood preservatives against borers (powder post beetles). The other part of the standard is:

### Part 1 Determination of threshold values of wood preservatives against fungi (*second revision*)

The composition of the Committee responsible for the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## METHODS OF LABORATORY TESTING OF WOOD PRESERVATIVES AGAINST FUNGI AND BORERS (POWDER POST BEETLES)

### PART 2 DETERMINATION OF THRESHOLD VALUES OF WOOD PRESERVATIVES AGAINST BORERS (POWDER POST BEETLES) (Second Revision)

#### 1 SCOPE

This standard (Part 2) lays down the method for the laboratory testing of wood preservatives against borers (powder post beetles) by exposing the samples for four pairs of adult beetles or keeping them along with material infested with powder post beetles attack.

#### 2 METHOD OF TEST

The method determines the toxicity of the surface applied with wood preservatives to the powder post beetles (*Lyctus species* and *Minthea rugicollis*).

The method is applicable to the tar-oil, water-borne and organic solvent types of wood preservatives. It enables comparisons to be made between preservatives which belong to any one of the types, since it is not possible to ensure that one test will accurately take into account the different mechanisms by which various preservatives operate under service condition.

#### 3 PRINCIPLE

**3.1** The principle of this test is to determine whether attack takes place, and adult subsequently emerge from samples of susceptible wood which have been initiated in the preservative and exposed to the test insect for egg laying. Control test with wood blocks of similar types which have been treated in the solvent only, as well as with initiated test pieces, are carried out at the same time, both types of control material being also exposed to the test insect for egg laying.

#### 3.2 Preparation of Test Samples

**3.2.1** The test samples shall be made from the timber of semul or rubber or mango and shall be of sizes 100 mm × 40 mm × 12.5 mm. The test samples will have the long axis parallel to the grain of the wood and the wide face tangential to the growth rings. These test samples shall then be open-piled and thoroughly dried in a well-ventilated room. These shall not be dried in a kiln or otherwise heated. Only those blocks which are clean, bright, free from knots and are of

heartwood showing no abnormalities in structure or rate of growth shall be used. Each test sample shall be tested for starch content and those in which it is inadequate, shall be rejected (see Annex A).

**3.2.2** Before being treated in the preservative, the test samples shall be conditioned for two weeks at 25° to 30°C and 70 to 75 percent relative humidity to attain an equilibrium moisture content of approximately 15 percent. The end grain of the blocks shall be sealed with paraffin wax or other suitable sealant before treatment, in order to prevent undue penetration of the preservative through the ends.

Untreated control blocks shall be selected and end-coated in a similar manner. The total number of samples required for each test shall be as follows:

- a) 10 numbers to be treated in preservative, at each concentration used;
- b) 5 numbers to be treated with solvent only; and
- c) 5 numbers of untreated control samples.

#### 3.3 Treatment Procedure

A series of dilutions of the preservative shall be prepared on a weight/weight basis. A minimum of five concentrations, arranged about the expected toxic limit, shall be used. In the case of a new preparation of which the approximate toxic limit is unknown, the concentration should be in a widely spaced geometric series in the first test and a more closely graded arithmetic series in subsequent tests.

If the preservative is soluble in water, freshly prepared aqueous solutions will be used. Preservatives that are insoluble in water shall be dissolved in a volatile liquid such as benzene or other suitable solvents which has been shown not to leave a residue toxic to the test insects. The test samples (10 percent concentration) shall be weighed and then completely immersed for 1 min in the solution, treatment with the most dilute solution being carried out first. A series of five control test samples shall be treated in a similar way in the solvent employed for dilution of the preservative.



If the preservative is in the form of an oil-in-water emulsion, the control test pieces shall be treated in an oil-in-water emulsion which has the same composition as the preservative, except that the toxic ingredients are omitted.

It is essential to follow the same dipping procedure in detail in all tests as slight variation may influence greatly the amount of preservative retained.

On removal from the treating fluid the surplus liquid shall be quickly shaken off the paraffin-coated ends blotted on absorbent paper and the blocks immediately reweighed. The amount of preservative taken up by the blocks shall be calculated from the rate of the liquid absorbed (weight after treatment minus the initial weight) and the concentration of the solution. The concentration of the preservative shall be expressed as kilogrammes per cubic metre of exposed wooden block. Five blocks per concentration shall be selected in which the weight of solution absorbed does not vary by more than 15 percent from the average absorption of the batch. The test samples shall then be dried, by passing air at a temperature of not higher than 30°C over them, till all the control test samples treated in the solvent only, have returned approximately to their initial weight.

All the test samples (including the five untreated control samples) shall then be stacked in open at room temperature for at least a month.

### 3.4 Test Insects

Adults of the powder post beetles, *Lyctus brunneus slephs* or *Minthia rugicollis* shall be used for the tests and these shall be obtained from laboratory cultures.

For initiation of culture, beetles are obtained from naturally infested wood stored outside, which have to be brought and maintained in the laboratory. Untreated timber such as semul/mango/rubber/bahera/dry tapiocca chips, which serve as feeder with starch, shall

be kept along with the infested sample for continuous multiplication of the beetles.

The test samples shall be stored singly in glass containers provided with cambric (finely woven cotton) cover, held in place with rubber bands to reduce the risk of mite infestation. Test samples per concentration, five untreated control samples and five treated with the solvent alone shall be exposed individually to four pairs of beetles or keeping them alongwith material infested with powder-post beetles attack. The condition during the test shall be 25° to 30°C and 70 to 75 percent relative humidity. When all the beetles are dead, they shall be removed.

### 3.5 Examination of Test Sample

The samples shall be stored until emergence of the first generation of adults from untreated control is in progress (6-8 months). After this has occurred, all the blocks shall be examined. Sample with no exit holes shall be finally split with an axe to ascertain whether live or dead larvae or tunnels are present.

### 3.6 Evaluation and Reporting of Results

The number of samples, treated and untreated, which contain exit holes shall be recorded, as well as the number of treated sample without exit holes in which live larvae are found.

The threshold value (toxic limit) shall be expressed as the interval between the highest concentration at which the adult beetles emerged or live larvae are found at the end of test and the concentration next highest in the series in which no adults emerge and all larvae are dead. These concentrations shall be expressed as kilogrammes per cubic metre of wood.

The concentration of treating solution found necessary to give these figures shall also be stated, as well as the diluents used and the interval between impregnation of treated samples and exposure to the infestation.

## ANNEX A

(Clause 3.2.1)

## METHOD OF TESTING FOR STARCH CONTENT

**A-1** For the successful development of *Lyctus species* or *Minthea rugicollis* larvae it is necessary that adequate quantity of starch be present in the wood. This can be assessed by a visual test given below.

**A-1.1 Reagent**

**A-1.1.1 Iodine Solution (0.5 percent)** — Add 0.5 g of iodine to a solution of 1 g of potassium iodide crystals in 5 ml of water and dilute this solution to 100 ml water.

**A-1.2 Procedure**

It should be ensured that the surface of the wood to be tested is smooth and clean. The solution shall be applied with a small paint-brush, preferably to an approximate radial surface, that is the narrow side of the block. After the lapse of a minute or so, starch grains which are stained blue-black, will be clearly visible under a binocular microscope. Only blocks containing abundant starch grains indicated by development of blue colour, are suitable for use.

## ANNEX B

(Foreword)

## COMMITTEE COMPOSITION

Timber and Timber Stores Sectional Committee, CED 9

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In personal capacity (2989/D, 12th Main HAL II Stage, Bangalore-560008)	SHRI SHYAM SUNDER ( <i>Chairman</i> )
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